IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:	Docket No.: 6161.0096.US
Chang Seob KIM	
Serial No.: 10/667,602	Group Art Unit: 1745
Confirmation No.: 9753	
Filed: September 23, 2003	Examiner: ALEJANDRO, Raymond

For: **ELECTRODE ASSEMBLY FOR LITHIUM ION CELL AND LITHIUM CELL USING THE SAME**

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Commissioner for Patents
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DECLARATION UNDER 37 C.F.R. § 1.132

Sir:

1. I, Chang Seob Kim, do declare and state:

2. I am the inventor of all claims of the above identified application, including currently pending claims 1, 3, and 7-9.

3. I understand that claim 1 is rejected as being allegedly unpatentable over Japanese Patent Application Publication No. 10-214614 issued to Inoue ("Inoue"), and also over Chinese Patent Application Publication No. 2473755 ("CN '755").

4. Claim 1 recites the following relevant features:

   a. "wherein the negative electrode lead comprises a planar portion electrically coupled to the negative electrode plate and a curved portion arranged out of plane from the planar portion, the curved portion having the same width as the planar portion, and the current interrupter is arranged in the curved portion of the negative electrode lead, and

b. wherein the current interrupter has a cross-sectional area that is smaller than a cross-sectional area of an adjacent portion of the planar portion."

5. Inoue and CN '755 are different than the invention of claim 1 because Inoue and CN '755 both fail to disclose "a curved portion arranged out of plane from the planar portion." Therefore, they also fail to disclose "the current interrupter is arranged in the curved portion of the negative electrode lead."

6. Even though Inoue and CN '755 fail to disclose "the specified curved portion out of plane from a planar section," claim 1 stands rejected over these references because, according to the examiner, "changes in shape is [sic] a matter of choice ... absent persuasive evidence that the particular configuration of the claimed electrode lead is significant or critical." Office Action, page 5, 6 (emphasis added). The examiner also asserts that "aesthetic design changes having no mechanical function cannot be relied upon to patentably distinguish the claimed invention from the prior art." Office Action, page 5, 6 (citing to In re Seid, 73 USPQ 431, emphasis added).

7. However, the curved portion of the negative electrode lead in the present invention of claim 1 is not an aesthetic design feature. Rather, the curved portion, and more specifically, the arrangement of the current interrupter in the curved portion, provides a specific mechanical function to this invention that would be recognized by a person having ordinary skill in the art ("PHOSITA").

8. It is well known that a negative electrode lead in a rechargeable battery contacts a negative electrode terminal to complete a circuit and to permit the rechargeable battery to operate. As shown in the accompanying figures, the curved portion in the negative electrode lead 36 creates a spring effect and

maintains the negative electrode lead 36 in contact with the negative electrode terminal 63c when the electrode assembly 30 is included in a can. See, e.g., Fig. 6B.

9. However, the purpose of the current interrupter 36a is to break the circuit or at least reduce the current through the negative electrode lead in the event of over-current.

10. Therefore, during operation of the rechargeable battery, the goal is to maintain contact between the negative electrode terminal and the negative electrode lead. In the case of over-current, the goal is to break the circuit through the negative electrode lead quickly to avoid an explosion.

11. As recited above, the current interrupter is arranged in the curved portion of the negative electrode lead in the current invention recited in claim 1. This arrangement furthers the second goal: to break the circuit path quickly in the event of over-current.

12. When the negative electrode lead shown in Fig. 3 contacts the negative electrode terminal, an axial compressive stress is imparted to the negative electrode lead. Further, the maximum compressive stress in the curved portion is greater than the average compressive stress in the planar portion of the negative electrode lead. The increased compressive stress in the curved portion is caused by a P-delta (P-Δ) effect from eccentric axial loading. Because the loading through the curved portion is eccentric with respect to the planar portions of the negative electrode lead, the compression creates an axial compressive force and a moment in the curved portion.

13. A moment may be described generally as a force-couple, including an axial compression force and an axial tension force spaced apart by some distance.

The moment increases the maximum compressive force along an inner edge of the negative electrode and decreases the maximum compressive force along the outer edge of the negative electrode lead. This would be understood by an engineering student at the undergraduate level who has taken at least one Mechanics of Materials course involving moment couples, free body diagrams (FBDs), and eccentric loading of axially-loaded members (i.e. columns).

14. Because the maximum compressive force is increased along the inner edge of the curved portion of the current interrupter, which may have a reduced cross-sectional area compared to the negative electrode lead, I disclosed a lower limit on the cross-sectional area of the current interrupter 36a to avoid weakening the "structural strength of the negative electrode lead 36." See page 10, lines 3-8 of the specification. Further, in the case of over-current, the arrangement of the reduced cross-section current interrupter 36a in the higher-stress curved portion of the negative electrode lead 36 would best ensure "a disconnection" at the current interrupter 36a.

15. Specifically, in the case of over-current, the current interrupter will heat up. Heat generation increases electrical resistance through the current interrupter, and also mechanically weakens the current interrupter. Because the current interrupter has a smaller cross-section than the negative electrode lead, and has a greater mechanical stress as a result of the eccentric loading, mechanical weakening of the current interrupter due to the generated heat causes the current interrupter to break or disconnect from the negative electrode lead quickly to avoid an explosion from thermal runaway.

16. For at least these reasons, the arrangement of the current interrupter 36a as recited in claim 1 offers a mechanical advantage over the disclosures of Inoue and CN '755.

17. Further, a person having at least the knowledge of an undergraduate level engineering student would understand these advantages in view of the various disclosures, including:

    a. The disclosed lower limit on the cross-sectional area of the current interrupter 36a to avoid weakening the "structural strength of the negative electrode lead 36." See page 10, lines 3-8 of the specification.

    b. A warning that if the cross-sectional area is insufficiently reduced, disconnect may not result. See page 10, lines 5-7 of the specification.

    c. Figures 5A to 5F, which disclose various embodiments of a current interrupter 36a arranged in the curved portion of the negative electrode lead 36. See page 10, lines 11-14 of the specification.

18. In view of this persuasive evidence that the particular configuration of the claimed electrode lead is significant and that the significance would be known by a PHOSITA, the invention of claim 1 is distinct from Inoue and CN '755.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18, United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: 3rd Aug. 2007

Chang Seob Kim